REMARKS

The above amendments to the above-captioned application along with the following remarks are being submitted as a full and complete response to the Office Action dated September 10, 2007. In view of the above amendments and the following remarks, the Examiner is respectfully requested to give due reconsideration to this application, to indicate the allowability of the claims, and to pass this case to issue.

Status of the Claims

As outlined above, claims 11-15 stand for consideration in this application, wherein claims 11-15 are being canceled without prejudice or disclaimer, while new claims 11-15 are hereby submitted for consideration.

All amendments to the application are fully supported therein, including Fig. 1 and page 16, line 10 - page 39, line 3 of the specification. Applicants hereby submit that no new matter is being introduced into the application through the submission of this response.

35 U.S.C. §101 Rejection

Claims 1-10 were rejected under 35 U.S.C. §101 on the ground of the claimed invention being directed to non-statutory subject matter. As set forth above, claims 1-10 are being canceled, and new claims 11-15 are being added.

35 U.S.C. §101 sets forth "*whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new improvement thereof, may obtain a patent thereof...*" The court held that mathematical algorithms are not patentable subject matter to the extent that they are merely abstract ideas. See *Diehr, 450 U.S. 175 (1981)*. However, the court in *State street Bank* stated that an algorithm would be patentable if it is applied in a "useful" way. See *State Street Bank v. Signature Financial Group, 149 F.3d 1368* (Fed. Cir. 1998). Also, the court in *In re Alappart* held that data transformed by a machine through a series of mathematical calculations to produce a smooth waveform display on a monitor constitutes a practical application of an abstract idea (a mathematical algorithm, formula, or calculation) because it produces "a useful, concrete and tangible result" – smooth waveform. See *In re Alappart*, 33 F.3d 1526, (Fed. Cir. 1994).

Here, new claims 11-15 are directed to a method for implementing a fast Fourier transformation on a data array in a parallel-processing computer in order to increase efficiency of the computation including Fourier transformation with a parallel-processing

computer. In the parallel-processing computer having a distributed-memory configuration, pieces of data serving as an object of calculation are stored in memories distributed among the processors so that the processors are capable of carrying out computations on the pieces of data in parallel processing. If a specific one of the processor requires data owned by another processor in the course of processing, the specific processor must wait for the required data to be transferred from the other processor before continuing the processing. Thus, in general, the parallel-processing computer having a distributed-memory configuration incurs an overhead of time required for transferring data from one processor to another in addition to the processing time. For this reason, in order to increase the efficiency of computation, it is necessary to adopt a computation method exhibiting such a high degree of processing parallelism that computation can be done by incurring only the shortest possible period of time required for communication between processors. In addition, a large number of parallel-processing computers having a distributed-memory configuration include a mechanism, which is used for transferring data from a specific one of the processors to another processor while the specific processor is processing other data. In this configuration, if it is possible to contrive a computation method capable of carrying out processing of data and transfers of other data at the same time, the time it takes to transfer other data can be concealed behind the processing time so that the efficiency of computation can be raised. (Page 2, line 7 – page 3, line 9 of the specification)

In the methods as recited in claim 11, 14, and 15, Fourier transform processing of a part in a data array is carried out, while relocating a result of Fourier transform processing on other parts in the data array are carried out. Therefore, a part of or the entire time for transferring data among a plurality of processors in a parallel-processing computer can be concealed behind the time for the processing of Fourier transformation, and thus, the efficiency of the computation is increased. (See Paragraph [0088] in US 2004/0236810) As such, the claimed invention is not a mere abstract idea, but a method for practical improvement in efficiency of the computation including Fourier transformation. Therefore, Applicants respectfully submit that the claimed invention creates a useful, concrete, and tangible result, and thus, meets the requirements under 35 U.S.C. §101.

Accordingly, withdrawal of this rejection is respectfully requested.

Prior Art Rejections

35 U.S.C. §103(a) Rejections

Claim 1 was rejected under 35 U.S.C. §103(a) as being allegedly unpatentable over Balasundarum et al. (U.S. Patent No. 5,548,761). Claims 9-10 were rejected under 35 U.S.C. §103(a) as being allegedly unpatentable over Balasundarum. As set forth above, claims 1-10 are being canceled, and therefore, these rejections are moot.

New claims 11-15

In a method as recited in claim 11, a data array is divided into a plurality of data portions with a processing apparatus, the plurality of the data portions are divided into a first part and a second part with the processing apparatus on the basis of whether a coordinate of the data in the second axis direction is odd or even; first processing which is Fourier transformation of the first part along a direction of a first axis is carried out with the processing apparatus; second processing which is a Fourier transformation of the second part along the direction of said first axis is carried out with the processing apparatus, while a result of the first processing is relocated among the plurality of processors; and the Fourier transformation on the relocated data is performed along a direction of a second axis with the processing apparatus.

In a method as recited in claim 14, a first $\log_2(NX - 1)$ steps of transformation processing is carried out only on data elements having even-numbered X coordinates in the data array along a direction of the X axis with the processing apparatus, concurrently carrying out transfer processing of data elements having even-numbered X coordinates in the data array so that the transferred data elements are divided onto each of planes that are oriented perpendicularly to the direction of the Y axis, and each of divided data elements is stored into the memories employed the plurality of processors. A method as recited in claim 15 for implementing a one–dimensional Fourier transformation in a parallel-processing computer has substantially the same features of the method as recited in claim 14.

In the methods as recited in claims 11, 14, and 15, a data array to be Fourier transformed are divided into a plurality of parts on the basis of whether the coordinate in one direction of an axis is odd or even. At least a part of data or a result of processing Fourier transformation is transferred while processing of Fourier transformation of other part in the data is carried out. Therefore, a part of or the entire time for transferring data among a plurality of processors in a parallel-processing computer can be concealed behind the time

for the processing of Fourier transformation. Consequently, the efficiency of the computation including Fourier transformation is increased. (See Paragraph [0088] in US 2004/0236810)

In contrast, Balasundaram shows compiler optimization and application of a code for 3D-Fast Fourier transformation. However, Balasundaram does not show or suggest dividing data into a plurality of parts on the basis of whether the coordinate of the data in the direction of an axis is odd or even. Clearly, Balasundaram cannot and does not show or suggest that second processing which is a Fourier transformation of the second part along the direction of said first axis is carried out with the processing apparatus, while a result of the first processing is relocated among the plurality of processors, as recited in claim 11 In addition, Balasundaram cannot and does not show or suggest that a first $\log_2(N_X - 1)$ steps of transformation processing is carried out only on data elements having even-numbered X coordinate in the data array along a direction of the X axis with the processing apparatus, concurrently carrying out transfer processing of data elements having even-numbered X coordinate in the data array, as recited in claims 14-15.

Therefore, at the time the invention was made, one of ordinary skill in the art could not and would not achieve all the features as recited in claims 11, 14, and 15 in view of Balasundaram.

As to dependent claims 12-13, the arguments set forth above with respect to independent claim 11 are equally applicable here. The corresponding base claim being allowable, claims 12-13 must also be allowable.

Accordingly, claims 11-15 are not obvious in view of all the prior art cited.

Conclusion

In light of the Amendments and Remarks, Applicants respectfully request early and favorable action with regard to the present application, and a Notice of Allowance for all pending claims is earnestly solicited.

Favorable reconsideration of this application as amended is respectfully solicited. Should there be any outstanding issues requiring discussion that would further the prosecution and allowance of the above-captioned application, the Examiner is invited to contact the Applicants' undersigned representative at the address and phone number indicated below.

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